

A NEW SPECIES OF TILEFISH (FAMILY BRANCHIOSTEGIDAE)
FROM EASTERN AUSTRALIA

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Synopsis

Until recently the genus *Branchiostegus* was represented in Australia only by *B. wardi*, thought to be restricted to waters off southern Queensland and New South Wales. A specimen of this species has been taken recently from New Caledonia and a new species of *Branchiostegus* trawled off New South Wales. The new form is characterised by a colour pattern of 18–19 black body bars, two broad yellow bands on the caudal fin, yellow spots on the dorsal fin and 67–72 pored lateral line scales. Both Australian species are benthic carnivores. *B. wardi* appears to spawn a number of times per year.

INTRODUCTION

The genus *Branchiostegus* is represented by eleven nominal species found mainly in the tropical Indo-Pacific; exceptions are *B. semifasciatus* from West Africa and *B. sawakinensis* which ranges into the Red Sea from the Indian Ocean. The only species previously known from Australia, *B. wardi*, is not restricted to the tropics but occurs off southern Queensland and New South Wales (Marshall, 1965).

A revision of the family Branchiostegidae has recently been completed (Dooley, 1974). During this study a second Australian species became apparent which is strikingly different from *B. wardi*, particularly in colour pattern.

MATERIALS AND METHODS

Measurements were made with dial calipers to the nearest 0.5 mm and conform to those defined by Hubbs and Lagler (1958). Measurements are expressed as per cent standard length (SL) or per cent head length (HL). Head length was taken from the tip of the snout to the tip of the opercular spine. Cheek depth was measured vertically from the lower rim of the orbit to the lower margin of the preoperculum. Opercular length is the horizontal distance from preoperculum to opercular spine; opercular scale counts were also made along this line. Vertebral counts were made from radiographs.

The holotype has been deposited at the Australian Museum, Sydney (AMS) and the paratypes at the Australian Museum, at the Queensland Museum, Brisbane (QM), at the California Academy of Sciences, San Francisco (CAS), at the United States National Natural History Museum, Washington, D.C. (USNM), at the British Museum of Natural History, London (BMNH) and at the Museum National d'Histoire Naturelle, Paris (MNHN). All specimens were obtained by bottom trawl.

Branchiostegus serratus n. sp.

Holotype. AMS I. 16207–004, 285 mm SL, Newcastle, New South Wales, Australia, 8 May 1971, Sydney Fish Markets, J. Paxton.

Paratypes. New South Wales: AMS I. 16207–002, USNM 209532, USNM 209533, (3) 245–290 mm SL, data as holotype; AMS I. 15916–003, –004, –005,

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-006, (4) 263-275 mm SL, Newcastle, 2 Feb. 1971, N.S.W. State Fisheries; AMS IB. 5074, 240 mm SL, off Lake Illawarra, Jan. 1961, J. Woore; AMS I. 15885-006, 228 mm SL, Newcastle (33° 13'-32' S; 151° 50'-52' E), 27 Oct. 1970, 110-150 m depth, T. Gorman and T. Johnson; AMS IB. 2908, 405 mm SL, off Coff's Harbour, 21 Jan. 1953, J. Woore; AMS I. 17312-001, -002, -003, -004, (4) 237-302 mm SL, BMNH 1973.7.17.3, 232 mm SL, MNHN 1973-36, 235 mm SL, CAS 28355, 229 mm SL, Newcastle, Sept. 1971, Sydney Fish Markets, J. Paxton. Queensland: QM I-8707, 268 mm SL, N.E. Cape Moreton, 162 m depth; QM I-8968, 213 mm SL, off Cape Moreton.

Diagnosis. The new species is distinguished from all congeners by the following combination of characters: the presence of a series of 18 or 19 dark vertical bars on the dorsal portion of the body, 67-72 pored lateral line scales, usually seven dorsal spines and the absence of dark pigmented areas on the operculum, dorsal head ridge and pectoral axillae.

DESCRIPTION

The following counts are of the holotype, with those showing variation in the 19 paratypes in parentheses: dorsal fin rays VII, 15 (VI (2), VII (17)); anal II, 12 (12 or 13); pectoral 17 (17 or 18); pelvic I, 5; principal caudal rays 17; cheek scales from preopercular angle to orbital rim 10 (10-13); opercular scale

TABLE 1
Frequency distribution of pored lateral line scales in Branchiostegus wardi and B. serratus

	48	49	50	51	52-66	67	68	69	70	71	72	\bar{X}
<i>B. wardi</i>	2	11	4	1				49.2
<i>B. serratus</i>		2	4	3	5	2	4	69.7

rows 7 (5-7); scales above lateral line 8 (7-10); scales below lateral line 22 (20-25); pored lateral line scales to hypural crease 70+2 on tail (67-72, Table 1); gill rakers 7+11 (18-20, Table 2); branchiostegal rays 6; vertebrae 10+14.

Measurements are given as per cent SL in Table 3; the following measurements are additionally presented as per cent HL: head depth 98% (98-108); snout length 39% (36-45); upper jaw 41% (37-43); lower jaw 48% (45-51); cheek depth 44% (39-47); opercular length 27% (24-29); snout to upper margin of preoperculum 77% (74-79); orbit diameter 26% (25-33); suborbital depth 23% (19-25).

TABLE 2
Frequency distribution of the number of first arch gill rakers in Branchiostegus wardi and B. serratus

		Gill Rakers (upper and lower limbs)						
		18	19	20	21	22	23	\bar{X}
<i>B. wardi</i>	19.9
<i>B. serratus</i>	18.6

Head blunt, snout steep, body elongate. Mouth oblique, upper jaw moderately protrusile; maxillary anteriorly reaching to below first nostril, posterior extension to below centre of pupil. Upper lip set in groove along entire edge; lower lip not grooved medially. Teeth on upper jaw in double bands, inner row of very fine canine teeth posteriorly, widening into four to five rows anteriorly; outer row of larger incurved canines with enlarged teeth

anteriorly and single large canine at extreme posterior margin of upper jaw. Lower jaw with fine canine teeth in patch on either side of symphysis; larger incurved canines in single row along outer jaw margin. No teeth on palatines, vomer or tongue; well-developed pharyngeal teeth.

Lateral line pores easily visible in low curve, passing slightly dorsal to middle of body bars and extending just past hypurals. Cephalic lateral line with five lower jaw pores from symphysis to preopercular margin, four-five pores in preorbital series, ten-twelve pores circumorbital, two pores below anterior nostril and one pore above posterior nostril; other cephalic pores present but not easily visible.

TABLE 3
Measurements of B. wardi and B. serratus in per cent standard length

	Holotype		<i>B. wardi</i>		Holotype		<i>B. serratus</i>		
	AMS	IA. 5130	Specimen	Ranges	\bar{X}	AMS I.16207-	Paratype	Ranges	\bar{X}
				(n=18)		004		(n=19)	
Standard length (mm)	..	327	215-336	263	285	213-405	267		
Body depth	26.0	22.6-26.1	24.57	26.1	24.6-27.7	26.77		
Body width	14.1	11.8-13.3	12.55	13.2	11.8-13.7	12.82		
Dorsal fin length	54.1	56.1-62.1	58.87	60.7	55.5-63.2	60.88		
Anal fin length	29.4	27.4-31.6	29.71	33.2	30.3-32.8	31.52		
Pectoral fin length	22.6	22.7-25.1	23.87	23.7	22.8-25.5	24.29		
Pelvic fin length	14.1	13.0-15.3	14.07	11.2	11.4-14.1	12.43		
Peduncle length	16.2	15.2-17.4	15.88	16.4	15.6-18.4	16.76		
Peduncle depth	11.6	10.0-14.2	10.88	11.4	10.3-11.9	11.01		
Head length	27.5	25.1-27.6	26.50	25.4	23.8-26.3	25.62		
Head depth	24.5	21.2-26.4	23.73	24.8	25.1-27.9	26.32		
Snout length	11.2	8.6-11.1	9.86	10.0	8.9-12.0	10.57		
Predorsal length	31.8	28.9-35.7	31.04	30.9	28.6-32.3	30.99		
Length of upper jaw	11.3	10.0-12.3	11.21	10.3	9.5-11.4	10.61		
Length of lower jaw	10.1	11.7-13.2	12.51	12.3	11.3-13.0	12.30		
Opercular length	7.7	6.9- 8.0	7.26	6.8	5.6- 7.3	6.51		
Diameter of orbit	5.7	5.8- 7.8	6.82	6.7	6.2- 8.5	6.97		
Cheek depth	11.3	9.1-11.0	10.13	11.1	9.4-11.8	10.86		
Suborbital depth	5.8	4.4- 5.7	5.07	5.8	4.6- 6.4	5.78		

Gill membranes free from isthmus and notched medially. Raised medial ridge on top of head from above posterior margin of orbit almost to dorsal origin. Anterior nostril within a thin cutaneous tube, posterior nostril open and oval shaped. Preopercular angle approximately 100-115°, with fine serrae on upper limb, less distinct serrae on lower limb. Operculum ending in single blunt spine or tab. Pseudobranch well developed; gill rakers blunt, generally three or more times longer than wide, although reduced toward distal ends of limbs.

Scales large, embedded in pockets, ctenoid over most of body, cycloid in head region; scales on cheek, operculum and extending on top of head to posterior margin of pupil. Scales on base of pectoral; caudal fin finely scaled, other fins naked; body with mostly regenerated scales.

Dorsal fin continuous, origin above pectoral bases; dorsal spines slender, first two close together, united at their bases and slightly shorter than remaining five spines; latter nearly equal in length and about $\frac{3}{4}$ length of anterior seven rays. Rays 8-12 about $\frac{1}{4}$ longer than anterior rays; ray 13 elongate, reaching just past hypurals and $\frac{1}{7}$ longer than next longest dorsal ray; rays 14 and 15 progressively shorter.

Anal fin continuous, origin below fourth dorsal ray; two anal spines slender and close together; first spine about $\frac{1}{2}$ length of second, second spine $\frac{1}{2}$ or less

length of anal rays. First three rays progressively longer, fourth ray about $\frac{4}{5}$ length of all but last two rays; penultimate anal ray elongate, reaching base of hypurals.

Pectoral fins pointed, with scaled bases; tip of fin reaching to level of anus; rays branched except stout first ray; length of first ray $\frac{1}{3}$ or less than longest pectoral ray. Pelvic fins rounded or slightly pointed, inserted below posterior margin of pectoral base and reaching to middle of pectorals. Caudal fin truncate, tips extended, dorsal tip longer than ventral tip; 17 principal and 15 branched rays; 11 dorsal and 10 ventral procurvent caudal rays.

Colour of holotype silver-white with some overlying yellow-orange and 18 (18 or 19 in paratypes) dark blue-violet wedge-shaped bars; bars shorter anteriorly and posteriorly, each tapering to a point about in line with lower margin of orbit. Iris golden, black area on dorsal margin of orbit; cheeks silver-white with an oblique dark band reaching from preoperculum nearly to orbit; snout yellow-orange with black area on medial portion of upper lip; dorsal portion of head coloured as snout with overlying greyish hue, a raised yellow ridge on top of

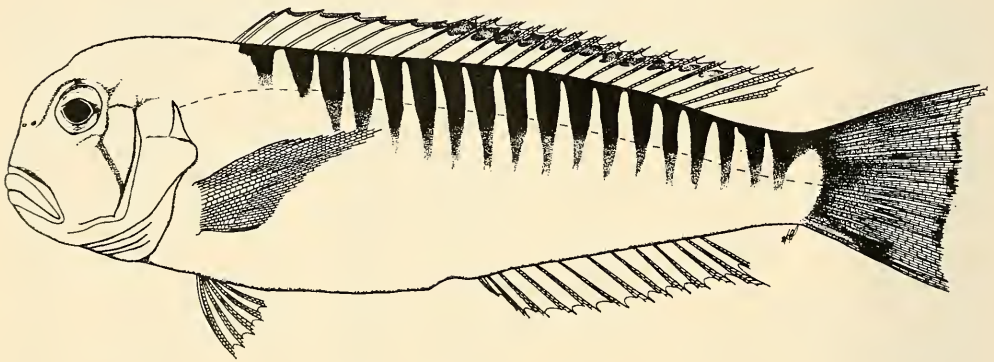


Fig. 1. *Branchiostegus serratus*.

head from vertical of posterior margin of orbit to near dorsal origin. Dorsal fin membrane dusky, spinous portion dusky with narrow yellow margin; some diffuse yellow in front of first ray and elliptical yellow spots along dorsal margin between each ray, decreasing between soft rays 8 and 9 and disappearing between rays 12 and 13; last ray dusky. Anal fin membrane translucent. Pectoral fin opaque with black edging on first and second rays. Pelvic fins translucent. Caudal fin base orange; central portion yellow with medial black area not reaching posterior margin; medial posterior margin edged in black, dorsal and anal lobes black (Fig. 1).

Distinguishing Features. Three species of *Branchiostegus* have a series of vertical dark body bars, *B. serratus*, *B. semifasciatus* from West Africa and *B. doliatus* from East Africa and Mauritius. *B. semifasciatus* has six dorsal spines (usually seven in *B. serratus*), 47–50 pored lateral line scales (67–72 in *B. serratus*), a dark head ridge and large dark area above the pectoral fin axillae and behind the dorsal margin of the operculum (both light in *B. serratus*). *B. doliatus* has six dorsal spines, 16–18 vertical body bars (18–19 in *B. serratus*), and a dark blotch on the operculum (none in *B. serratus*). The two Australian species can be distinguished by coloration, with *B. wardi* lacking vertical bars, pored lateral line scales (Table 1), and snout profile, with *B. serratus* having a steeper snout.

Etymology. The specific name is in reference to the series of dark body bars.

DISTRIBUTION AND BIOLOGY

Branchiostegus serratus is known only from the coast of New South Wales, where it is trawled from Coff's Harbour (30° 20' S) to Lake Illawarra (34° 30' S). The only recorded depth range is 110–150 m, from a State Fisheries trawl off Newcastle (33° S). The other Australian species, *B. wardi*, is known from Noosa Heads, southern Queensland (26° 25' S) to off Broken Bay, New South Wales (33° 30' S). A 410 mm specimen of this species was recently taken off the edge of a reef at 250 m off Noumea, New Caledonia (P. Fourmanoir, pers. comm.). Apparently both species are trawled in similar depths off New South Wales.

Fluctuations in the abundance of the North American tilefish *Lopholatilus chamaeleonticeps* have been well documented (Collins, 1884). The limited available evidence indicates that the Australian species may also undergo population fluctuations. *B. wardi* was first collected off Queensland in 1928 (Marshall, 1928) and a second specimen was trawled in 90–110 m off Port Stephens, New South Wales, in 1931 (Whitley, 1932). In 1972–73 from 50 to 300 kg of *B. wardi* per day were sent to the Sydney wholesale markets from the Newcastle-Port Stephens area. Fewer *B. serratus* arrived at the markets, from none to about 25 kg per day. Neither the *Thetis* Expedition of 1898, which trawled off Port Stephens–Newcastle in 60–100 m (Waite, 1899 : 20), nor the *Endeavour* Collections of 1909–1910, which were taken from 30–110 m off Port Stephens–Newcastle (McCulloch, 1911 : 3, 23), took any specimens of *Branchiostegus*. It is possible that both species are more abundant now than they were 60 or 70 years ago. However, this is impossible to verify since the amount of fish marketed in past years cannot be broken down by species ; moreover, methods of trawling have changed over the years, further making any comparison of numbers unreliable.

Stomach contents of 12 specimens of *B. wardi* and 7 specimens of *B. serratus* were examined. Both species are benthic carnivores, with remains of fish (*Apogonops anomalous*), molluscs (bivalves and gastropods), crustaceans (crabs, amphipods and stomatopods) and polychaetes in the stomachs and intestines of both species.

All of the type material of *B. serratus* proved to be mature. Selected market specimens of *B. wardi* (totalling 31) were dissected to determine the sex and reproductive state. A deviation from the expected 50/50 sex ratio was found both for *B. wardi* and for *B. serratus*. *B. wardi* specimens under 300 mm were predominantly females ; above 300 mm, only males were identified. Twenty-nine specimens of *B. serratus* were examined. Below 280 mm there were approximately equal numbers of males and females, but, as in *B. wardi*, only males were identified in the larger sizes. It can be hypothesised either that only males reach a larger size or that there is protogynous sex reversal. There is as yet no strong evidence for the latter hypothesis. Ovaries from specimens of *B. wardi* taken in June, July and September 1972 and in January 1973 were removed, preserved in 10% formal-saline and later dissected. The ovaries measured 35–50 mm in length and 10–20 mm in diameter ; ova of various sizes ranging from 0.2–0.8 mm in diameter were distributed evenly in the ovaries. No seasonal differences in gonad condition were noted. The range of ova size and the presence of large ova in all ovaries examined are indicative of multiple spawning during the year. The only ovaries of *B. serratus* examined were collected in June ; they were also filled with ova from 0.2–0.9 mm in diameter. The larvae, although unknown, would probably resemble those of *B. japonicus* (Okiyama, 1964). Larvae in four of the five tilefish genera (larvae of *Lopholatilus* are unknown) have been found to have similar arrangements of spinules and head serrations.

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